

Patent claims

1. Piezoceramic composition with the general molecular formula $Pb_{1-a}RE_bZr_xTi_yTR_2O_3$, in which
 - RE is at least one rare earth metal selected from the group 5 europium, gadolinium, lanthanum, neodymium, praseodymium, promethium and/or samarium with a rare earth metal proportion b,
 - TR is at least one transition metal selected from the group 10 chromium, iron and/or manganese with a transition metal valency W_{TR} and a transition metal proportion z and
 - The following relationship applies: $z > b/(4 - W_{TR})$.
2. Piezoceramic composition in which the rare earth metal proportion is selected from a range of 0.2 mol% to 3 mol%.
3. Piezoceramic composition in accordance with Claim 1 or 2, in 15 which a sum of the rare earth metal proportion and of the transition metal proportion is less than 6 mol%.
4. Piezoceramic composition in accordance with one of the Claims 1 to 3, in which the RE is a single rare earth metal and TR is selected from at most two transition metals or TR is a single 20 transition metal and RE is selected from at most two rare earth metals.
5. Piezoceramic composition in accordance with one of the Claims 1 to 4, with a value for a mechanical quality factor Q_m which is selected from a range 50 up to and including 1800.
- 25 6. Piezoceramic composition in accordance with one of the Claims 1 to 5, with a Curie-temperature T_c lying above 280°C.

7. Method for producing a piezoceramic composition in accordance with one of the Claims 1 to 6, in which a maximum particle growth of the piezoceramic composition is determined at a specific sinter temperature.
- 5 8. Method in accordance with Claim 7, where the following steps are performed:
 - a) Definition of the rare earth metal proportion b ,
 - b) Definition of the transition metal proportion z ,
 - c) Sintering of the piezoceramic composition at the sinter 10 temperature,
 - d) Determining a particle size of the sintered piezoceramic composition and
 - e) Repeating steps b) to d), with the transition metal proportion z being varied.
- 15 9. Method in accordance with Claim 7 or 8, with the transition metal iron with an iron proportion z_{Fe} and the transition metal manganese with a manganese proportion Z_{Mn} being used, so that the relationship to $z_{Fe} + 2 \cdot Z_{Mn} > b$ is produced and with the variation of the manganese proportion Z_{Mn} , essentially the dissipation factor $\tan \delta$ of the composition and with the variation of the iron proportion z_{Fe} , essentially the maximum value particle growth of the composition are set.
- 20 10. Piezoceramic body with a piezoceramic composition in accordance with one of the Claims 1 to 6.
- 25 11. Piezoceramic body in accordance with Claim 10, featuring a metallization selected from at least one of the group silver, copper and/or palladium.
- 30 12. Piezoceramic body in accordance with Claim 11, in which a proportion of palladium is selected ranging from 0% up to an including 30%.

13. Piezoceramic body in accordance with Claim 12, in which the proportion of palladium amounts to a maximum of 5%.
14. Piezoceramic body in accordance with one of the Claims 10 to 13, featuring a monolithic multilayer construction in which piezoceramic layers with the piezoceramic composition and electrode layers with the metallization are arranged alternating above one another.
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15. Piezoceramic body in accordance with one of the Claims 10 to 14, which is a component selected from the group actuator, bending converter, motor and/or transformer.
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16. Method for producing a piezoceramic body in accordance with one of the Claims 10 to 15, with the steps:
 - f) Provision of a green body with a piezoceramic composition in accordance with one of the Claims 1 to 6 and
 - 15 g) Sintering of the green body to the piezoceramic body.
17. Method in accordance with Claim 16, where a green body is provided with a metallization which is selected from the group silver, copper and/or palladium.
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18. Method in accordance with Claim 16 or 17, where the sintering is undertaken in an oxidizing or reducing sinter atmosphere.
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19. Method in accordance with one of the Claims 16 to 18, with a sinter temperature ranging from 900°C to 1100°C inclusive being selected for sintering.

20. Method in accordance with one of the Claims 16 to 19, with a green body with a plurality of particle growth seeds being used with the piezoceramic composition.